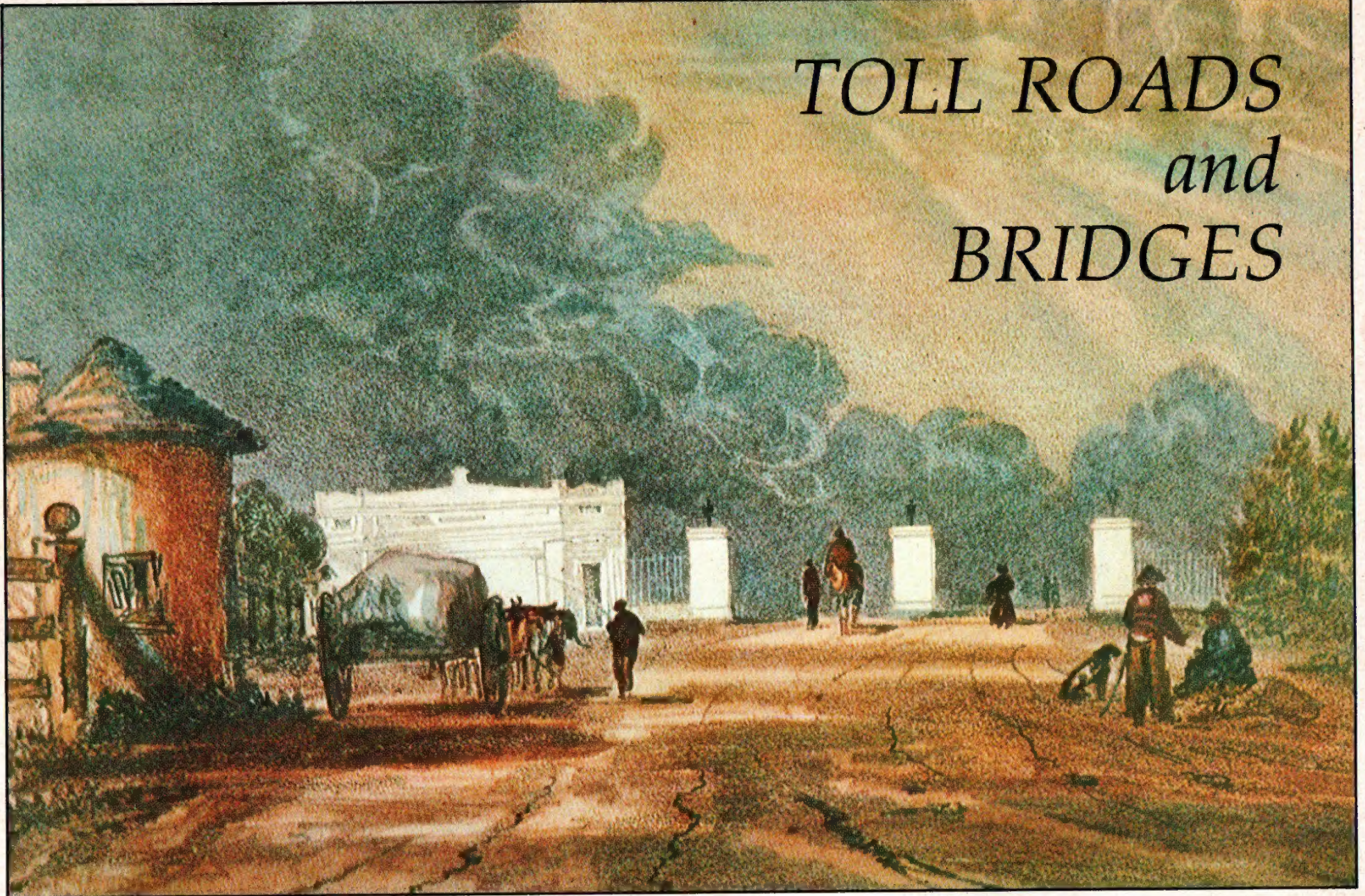


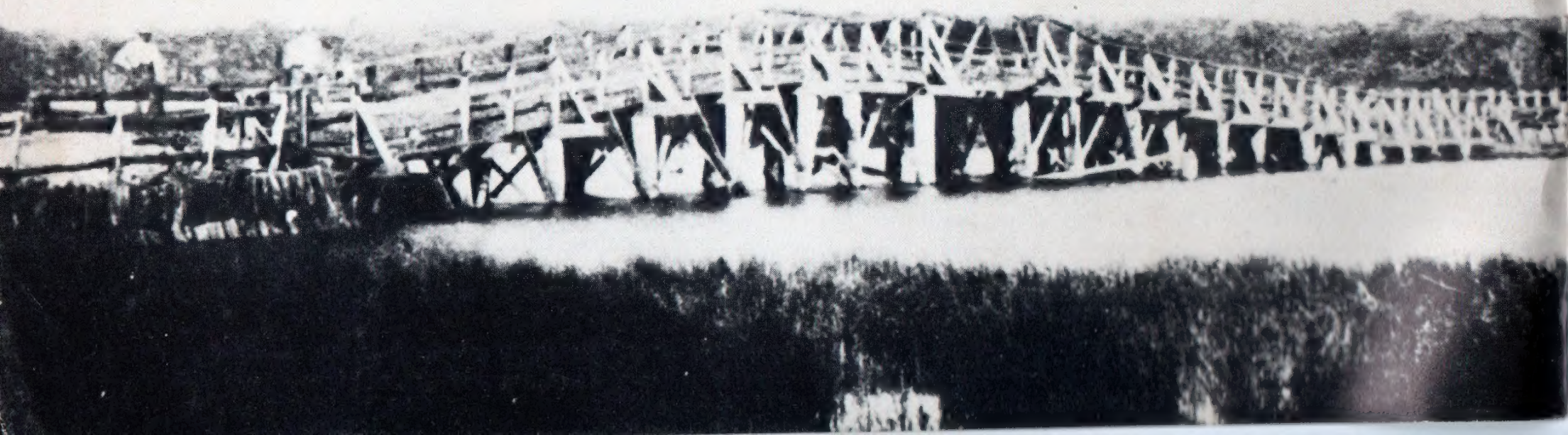
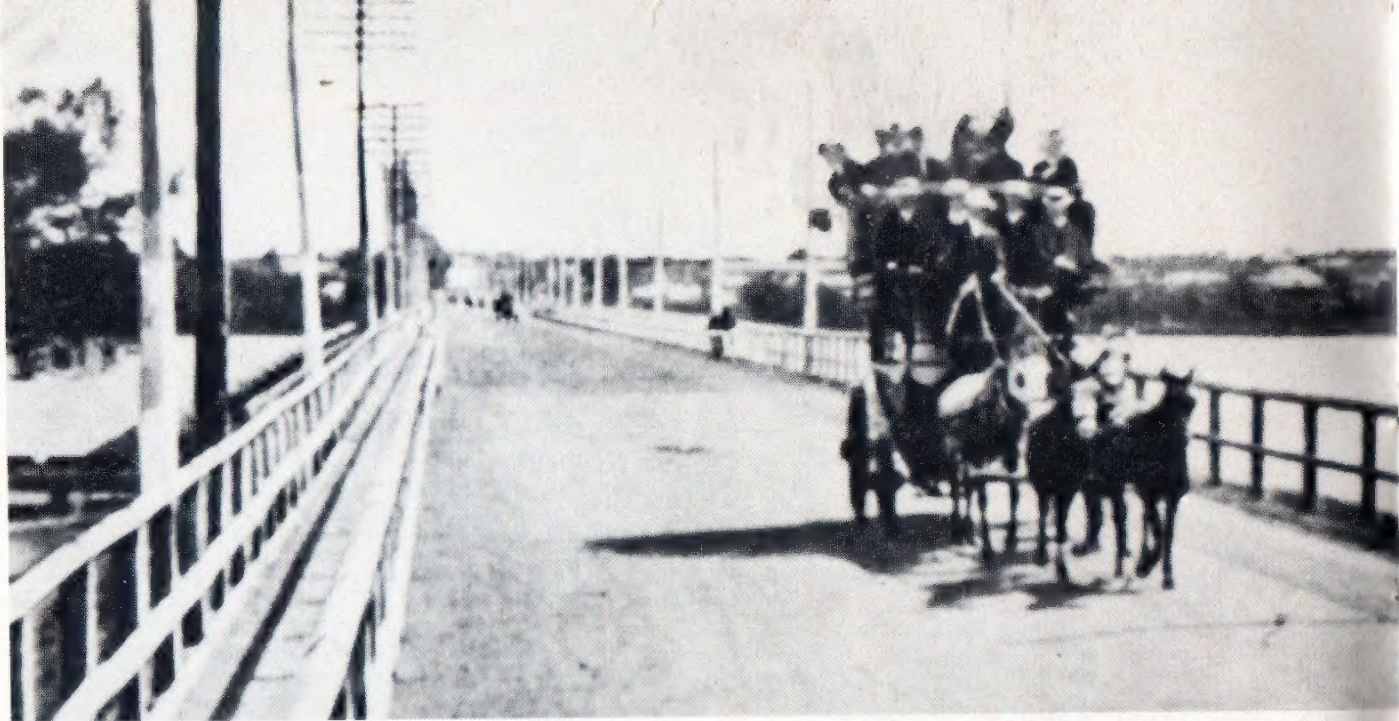
TOLL ROADS
and
BRIDGES



Front Cover: A lithograph of the "New Toll Gate" on Parramatta Road, published in J.G. Austin's Sydney Views, 1835. (By courtesy of the State Library of New South Wales.)

Right: An old photograph of traffic on the Causeway bridge over the Swan River, Perth.

Below: A very old photograph of the first Causeway bridge, opened in 1843 as a toll crossing.



TOLL ROADS AND BRIDGES

FOREWORD

History speaks of a Toll Road around 1950 B.C. It was built by the Assyrians and went from Syria to Babylon.

Tolls became popular in Europe during the Middle Ages and were widely levied to finance bridge construction. In fact a waiver from tolls was a medieval privilege in return for special services or payment.

EARLY TOLL SYSTEMS

England

England had tolls — called a Murage in 1189 and a Pavage in 1274. The first was levied on a person or merchant who passed through the gates of a city wall, the other was a toll or tax levied for street improvements within the city walls.

In 1281 tolls were levied on the old London Bridge, both for traffic over it and navigation under it! History tells us that after 500 years (from 1189) the British Parliament passed a law allowing county officials permission to erect toll gates and collect fees for road repairs.

Prior to the 18th century in England, the existing road system was usually maintained by the able-bodied men of each Parish, whose labour was required for a specified

period each year. This duty was not so onerous while horse-riders and pedestrians used the roads, but as the number of wheeled vehicles increased it became apparent that this procedure was no longer adequate.

One method for solving this problem was to establish "Turnpike Trusts", the first of which was created in 1706. These Trusts were formed under an Act of Parliament for the

"Turnpike" originated from "turnpole", which was an innovation introduced around the 17th and 18th Centuries to assist the collector and help to prevent toll avoidance. It consisted of a long pole, one end resting on a vertical post. Once the traveller paid his toll, the pole was swung out of the way permitting him to pass.



The Old Toll House at Glen Osmond, on the Mount Barker Road, South Australia.

purpose of constructing roads, and were permitted to finance their operations by the collection of tolls over a specified number of years. Initially the Trusts were not responsible for maintenance, but gradually the legal lives of the Turnpike Trusts were extended and maintenance was added to their responsibilities.

Trusts operated by borrowing money, then seeking to recoup it from tolls which were collected at locations where toll bars or gates had been erected to prevent the free movement of vehicles and goods. The toll system developed further during the early days of the "Industrial Revolution" when England experienced a rapid growth in urbanisation. Local people considered it unfair to bear the full costs when the ever-increasing volumes of "through" traffic were reaping most of the benefits of the road system. As a consequence, by 1820 Britain had 20 000 miles of toll roads in operation, returning a revenue in excess of £1 250 000 annually. However, as railways became more common and attracted much of the longer distance road transport trade, the Trusts became uneconomical and through the middle of the 19th century they gradually faded out. Local governing authorities took over the functions of the Trusts in building and maintaining roads.

Meanwhile, in the United States, the first engineered and planned road ever built was a privately constructed toll road, the turnpike between Philadelphia and Lancaster, Pennsylvania. This 62 mile length was opened in 1794 at a cost of \$465 000.

Right: Toll gate on the Great Ocean Road, Victoria, with the scale of charges – around 1921.



GREAT OCEAN ROAD TRUST SCALE OF CHARGES.

ONE WAY	DRIVE	25
ONE WAY	PASSENGERS	15
ONE WAY	TRUCK CYCLES WITH DRIVER	50
ONE WAY	TRUCK CYCLES 2+ TONS	25
ONE WAY	DRIVE	25
ONE WAY	PASSENGERS	15
ONE WAY	TRUCK CYCLES WITH DRIVER	50
ONE WAY	TRUCK CYCLES 2+ TONS	25
ONE WAY	TRUCK CYCLES 1+ TONS	75
ONE WAY	TRUCK CYCLES 1+ TONS	75

ATTENDANT WILL GIVE YOU A RECEIPT.

Australia

For the first 100 years of settlement in Australia the system of road and bridge tolls were similar to that in England, with those collecting the tolls being responsible for the construction and maintenance of particular roads and bridges.

To quote one example — in 1802 Mr Andrew Thompson built a pontoon bridge across South Creek at Windsor, New South Wales, and was given approval to collect tolls for the next fourteen years, provided he kept the bridge in repair. Neither this bridge nor a second such facility lasted the required fourteen years. Ultimately, a third bridge known as Howes Bridge, was built at this site in 1813.

This private company system was no more successful in Australia than it was in England. The sign of an early breakdown was observed during Governor Macquarie's term of office from 1810-1822, when he found it necessary to erect numerous Government toll bars to assist in collecting money for road maintenance. In 1811 for instance, toll bars were erected on Parramatta Road near the present site of Central Railway Station and at Becketts Bridge at Parramatta.

Typical Government toll fees were:

Sheep, pig, goat, ox	- one penny
Horse, mare, gelding, ass or mule	- two pence
Cart, dray or other two-wheeled vehicle	- three pence to six pence depending on number of horses
Coach	- nine pence to one shilling and six pence depending on the number of horses

The system was formalised in New South Wales in 1832 making it lawful for the Governor to levy tolls for providing funds to repair roads, bridges and ferries. A further Act was passed in 1840 enabling parishes to levy tolls, but this was superseded in 1855 by the establishment of Roads Trusts in Sydney and Newcastle areas.

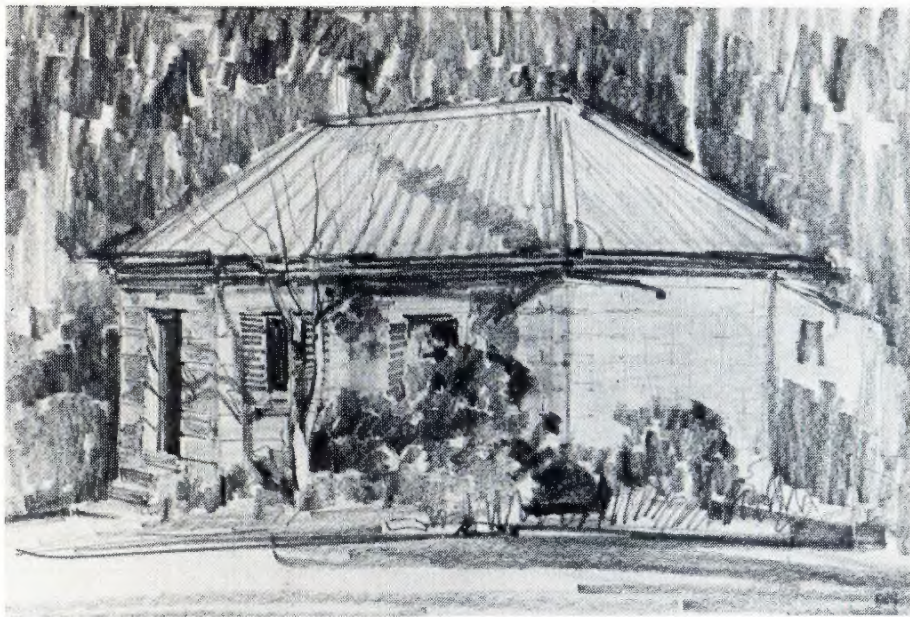
However, there was some return to the private toll system with the erection of the first bridge across the Nepean River near Penrith in the 1850's. This bridge and its replacement were both washed away. A ferry was then brought back into use until the first railway bridge, with some provision for road traffic, was completed in June, 1867.

A private company built a toll bridge over Darling Harbour at Pyrmont, Sydney in 1859. This bridge had an opening span for shipping. The company operated the bridge until 1884, when it was taken over by the State Government and used by traffic until 1981.

In South Australia, an Act for "Making and Maintaining the Great Eastern Road" was passed in 1841. The Act provided for tolls to be collected at Glen Osmond on the Mount Barker Road. As there were other roads into the Adelaide Hills without tolls, travellers using the Mount Barker Road felt that they were being discriminated against and the project was not a success. The board of Trustees was formally abolished in 1844 and the payment of tolls ended on 1st December, 1847, but the Old Toll House at Glen Osmond still remains as a monument to the system.

In Western Australia, the first bridges over the Swan River in Perth, at the site known as the Causeway, were opened by the Government as toll bridges in 1843.

In the Port Phillip District of New South Wales (later Victoria), the "Parish Roads Act" of 1840 established Trusts to make and maintain roads. Land owners within three miles



The old toll house at Mount Victoria, New South Wales, built in 1849. (By courtesy of the New South Wales Government Printer.)

of a road could elect trustees for a three year term to improve and maintain their roads. They were empowered to levy a rate not exceeding 6 pence per acre per annum on land owners in their area and collect tolls from those using the road.

In some cases — particularly for the larger streams — enterprising people established punts. In 1850, a punt was in operation on the Merri River at Warrnambool and for every load of produce a toll of 2 shillings and 6 pence was paid for the punt crossing. Horsemen were charged 1 shilling and footmen 6 pence.

A road tax operating in Tasmania was bitterly resented as the tax payers had no voice in the spending of it. At length, in 1846, a new Act was passed in which the tax was to be replaced by a system of tolls. Toll houses were erected, displaying the keeper's name and scale of fees. Persons going to and from church, or clad in the Queen's uniform, were exempt from paying toll.

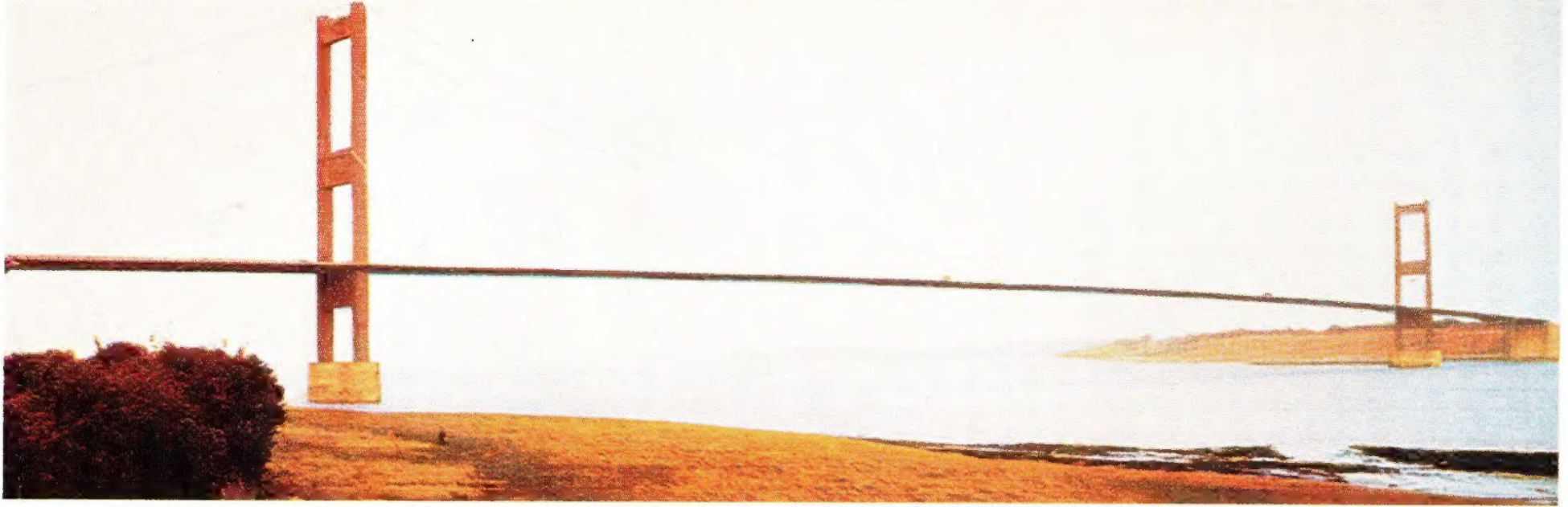
Toll systems gradually became unpopular in Tasmania due to the costs incurred and the existence of alternative routes. They were finally abolished in 1880 when competition from the railways for long distance travel resulted in little traffic on the roads.

In Queensland, the first road to Toowoomba and the Darling Downs was via Flagstone Creek and was called the Hell Hole Road. As far as can be ascertained, the road which became known as the Toll Bar Road was opened up in 1846, by local landowners who levied a toll for the purpose of maintenance.

Generally, within the Australian colonies during the period 1860 to 1890, the system of charging road tolls slowly declined. However, Victoria was the exception, and by 1870 had established a total of 123 toll gates which returned a total annual revenue of £90 680.



James Ward



A tranquil picture of the Severn Road Bridge, U.K. which was opened in 1966 as a toll structure. Drivers using it save 80 km in travelling between Wales and the south west region of England.

OVERSEAS TRENDS

In the United States, a new Pennsylvania Turnpike was opened as a toll road in 1940. This was followed by several hundred miles of other toll roads of freeway standard. Many of these were private roads which served in parallel to roads of the existing road system, thus providing relief from congestion, but at a price! However, use of these toll roads by ever increasing numbers of vehicles clearly indicated that people were prepared to pay for better quality roads, and this led to the introduction of a fuel tax surcharge to help finance the Interstate System. Currently, in the United States the Interstate System incorporates more than 2 300 miles (3 700 kilometres) of toll freeways, bridges and tunnels.

A somewhat similar system, but with more direct Government control and financing, was commenced in Japan in the late 1950's and progressed rapidly. Prior to this, Japan did not have any significant inter-regional road system, relying primarily on rail and sea transport.

Toll Roads in Europe now exceed 11 300 kilometres with a further 1 500 kilometres under construction, and 5 400 kilometres in the planning stage. Six nations form a Regional Association of European Toll Roads — Austria, France, Italy, Portugal, Spain, and Yugoslavia. In these countries tolls are fairly common on extensive lengths of high standard roads; whereas in the British Isles tolls are not charged on the Motorway System but only paid on structures such as the River Severn Bridge, the Forth Road Bridge, the Dartford-Purfleet Tunnel and the Tyne Tunnel at Newcastle.

Left: Old Toll Bar at Lexton, Victoria.



Traffic passing the old toll booth on Ryde Bridge over the Parramatta River, Sydney, in 1949. This toll was discontinued later in 1949 when the loans raised for the construction of the bridge in 1935 were paid off.

WHY PAY TOLLS?

When a Government provides a facility (services) for use by the whole community, it is usually financed from funds made available through revenue from taxation contributed by all members of that community. Frequently, where certain facilities are patronised more by one group than

another, the Government may adjust the system of payment to fall more fairly on the community in proportion to respective usage. Charging fares on public transport is an obvious example which may be classified as an essential community service irrespective of cost. Government transport systems

(buses, trains and ferries) cannot be operated solely by income from fares, but fare payment at least ensures that regular users contribute more than those who rarely use the system.

The process of paying tolls usually means that an income for a particular road, ferry or bridge will be assured, and a facility can be provided which otherwise may not have been possible. In a somewhat similar way the improved facility can be of benefit and offer a greater return to the present user.

Sometimes, State and Road Authorities have found it desirable to provide a facility which would serve and benefit a large section of the community, commerce and industry, even though the cost of the project would require more finance than is currently available and its magnitude would heavily tax construction and management resources. In these instances, either a private company may be invited to provide a toll facility, as described later, or the Government would borrow money and engage contractors to build the facility. In the latter case, the bulk of the cost could be met by collecting tolls from the users of the facility. The cost would be that of construction, any interest on loans for that purpose, maintenance charges, and the cost of collecting the tolls. It may then be argued whether the toll should be removed when construction costs have been recovered, or alternatively, whether it should be allowed to continue with subsequent surpluses used to offset maintenance and further extension/improvement.

Toll roads and bridges are generally only constructed when considered to be economically justified by an assured level of patronage. It is also argued that, where a road carries mainly long distance "through" traffic, a toll will prevent a financial burden being imposed on the state or country through which it passes. This has been the major reason for the recent growth in toll roads in Europe, where frequently



The Walter Taylor Bridge in the Brisbane suburb of Indooroopilly, is one of Australia's few suspension bridges. Opened in 1936, the 183 m long bridge crosses the Brisbane River. Tolls ceased in 1965.

the major roads in a region are used by "through" traffic. Generally, a toll system is more equitable because the user pays.

The main objection to tolls is, of course, that users are paying these tolls in addition to full tax and other forms of vehicle taxation. For this reason, any toll facility should provide an improved service over existing toll-free routes, and one could expect shorter travel time, less congestion and better travel conditions. Of course, in some instances, no free facility might be available (for example, a causeway or bridge to an island being inaccessible by other means). In this case, the service provided is the access which otherwise would not be available.



Above: Approaches to the toll plaza of the impressive West Gate Bridge, Melbourne, opened in 1978

Left: A toll collector on the Sydney Harbour Bridge. Since 1970, tolls have been collected from southbound traffic only. For drivers with the correct money, there are four booths with automatic collection equipment



Top right: On the Waterfall Bull Tollwork, south of Sydney, tolls may be paid at automatic collection booths.



Right: A toll supervisor is able to monitor the booths via a television link up.

TOLL SYSTEMS AT WORK

Newcastle-Sydney-Wollongong

In 1965 the "Main Roads Act" in New South Wales was amended to allow for the proclamation of "tollways" over the Newcastle-Sydney-Wollongong Corridor. Consequently, any new work which is designed to facilitate the movement of motor traffic in this Corridor can now be proclaimed as a tollway.

Toll revenue is used firstly for maintenance and repair of the facility and the costs incurred in collecting it, and then the remainder is used on repayment of the original construction cost, including loans and interest thereon. At the conclusion of all outstanding repayments, toll collection will be terminated. Between Newcastle and Wollongong the existing Pacific and Princes Highways have been improved and will remain as parallel toll-free routes.

Sydney Harbour Bridge

This 503 m main span arch bridge was opened to traffic on 19th March, 1932, at a cost, including land and approaches, of approximately £10M (\$20M). Prior to this, tolls were paid for transporting vehicles on ferries which operated across the Harbour. Most of the money to build the Harbour Bridge was borrowed by the State Government. Until 1946 a number of Councils on the northern side made regular contributions totalling about £750 000 (\$1.5M) to the Bridge Fund.

Toll collection began the day after opening, and was initially related to vehicle occupancy (e.g. all adult occupants, including driver, cost 3 pence each and children 1 penny each) and there were amounts paid representing the occupancy of trains and buses.

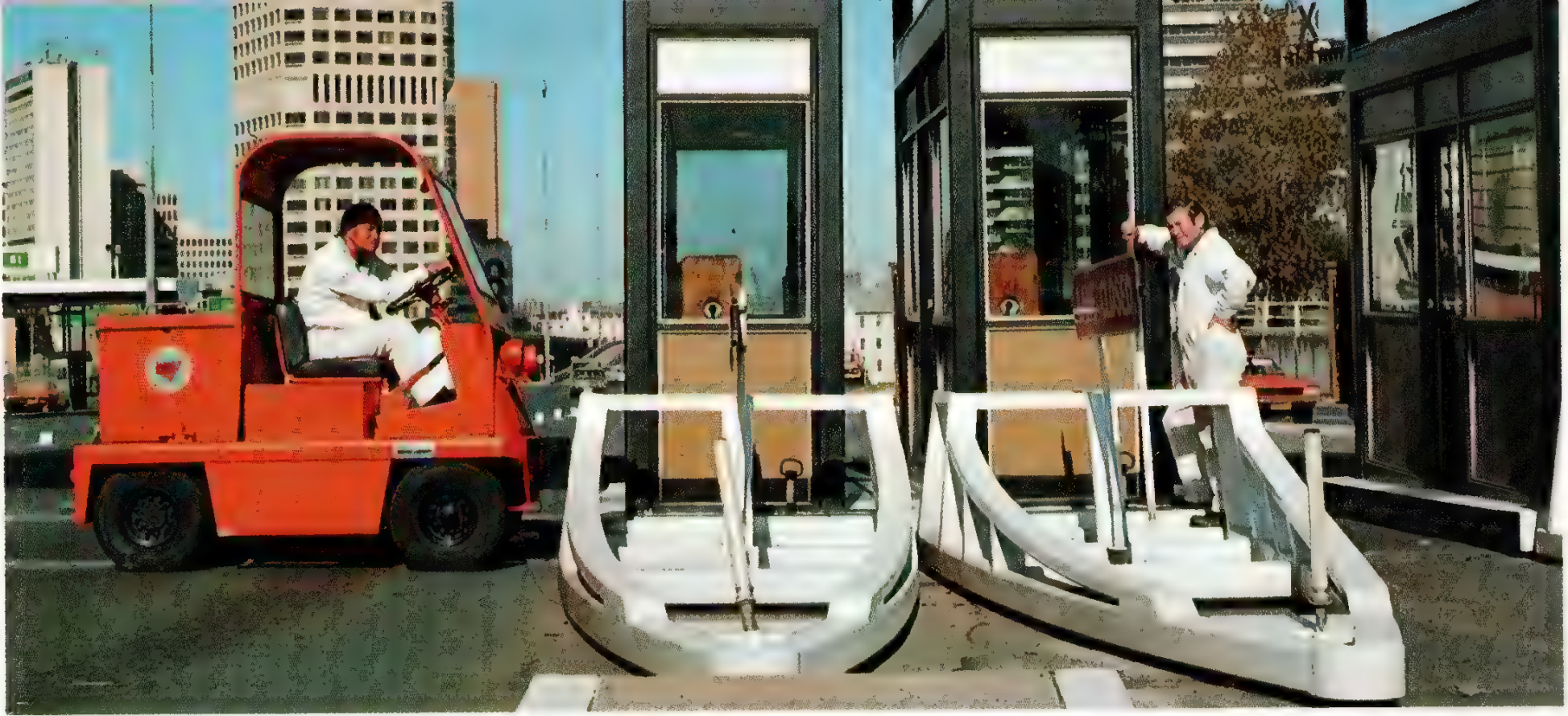
On 4th April, 1960 a change was made with the introduction of direct charging for motor vehicles regardless of occupancy. Since 4th April, 1970 tolls have been collected from vehicles travelling in one direction only and automatic toll collection machines have been introduced in four toll booths. All of these changes were made in the interests of simplifying toll collection and improving traffic flow.

Over the 48 years to June, 1980, money collected from traffic on the bridge has totalled \$127 M. Over the same period the interest on the loan has been paid, while the total amount spent on maintaining and improving the bridge, including collection of tolls, has been \$51 M.

Part of the money collected in tolls has been spent on building and improving roads such as the Cahill Expressway and the Warringah Freeway. Entrance and exit ramps at various locations along both of these facilities ensure that tolls are only paid by citybound traffic which actually crosses the Harbour.

A 1946 photograph of toll booths on the northern approach to the bridge carrying the Pacific Highway over the Hawkesbury River, just north of Sydney. Tolls were collected here from 1945 until 1954.





Moveable toll booths on the Sydney Harbour Bridge being manoeuvred into position by a small battery-operated tractor. The booths can be repositioned to cope with various traffic flows.

Story Bridge, Brisbane

Construction of this bridge, spanning the Brisbane River from Kangaroo Point to Fortitude Valley, commenced in May 1935 and was completed on 6th July, 1940 at a cost of £1.25M (\$2.5M). It was constructed by M. R. Hornibrook for the Queensland Government which then collected tolls until they were terminated nearly 7 years later on 1st May, 1947.

Other Bridges

By various Acts of Parliament over the years, and for varying periods of time, tolls have been charged for crossing particular bridges on Main Roads in New South Wales.

Three such bridges were Tom Ugly's Bridge on the Princes Highway over Georges River, Ryde Bridge over the Parramatta River, and Peats Ferry Bridge over the Hawkesbury River on the Pacific Highway. In each instance the toll was removed when all outstanding loans and other liabilities were discharged.

Right: West Gate Bridge toll booth.



PRIVATE TOLL ROADS, BRIDGES AND FERRIES

Where a large public road facility is needed and public money is not readily available to provide it, a practice sometimes adopted is to arrange for a private company or other authority to raise funds and build it. The company is then responsible for maintaining the facility and has the authority to charge a toll. After a specified time, called the Franchise Period, this approval to collect tolls ceases and the whole installation becomes the property and responsibility of the Crown.

There have been several examples of these practices in Australia over recent years. Three examples are the toll road from Sandgate to Redcliffe in Brisbane, popularly known as the Hornibrook Highway; West Gate Bridge in Melbourne, and the proposed new Gateway Bridge in Brisbane.

"Hornibrook Highway"

In 1931 the Queensland Government passed into law "The Tolls on Privately Constructed Road Traffic Facilities Act" which provided for a "person to construct and maintain roads, bridges and viaducts — levy and collect tolls thereon for a period called the Franchise Period, at the expiration of which the road, bridge or viaduct becomes the absolute property of the Crown".

Under this Act, in November 1931, the Government established the "Sandgate-Redcliffe Road Traffic Facility" with conditions binding Mr Manuel Richard Hornibrook. The Order fixed the Franchise Period at 40 years and set out toll rates such as three pence for bicycles, ranging up to one shilling for motor cars and two shillings and six pence for motor buses.



REAL ADS HERE

DEPENDABLE
DODGE

BORNHOLM
HIGHWAY

The road and bridgeworks were duly constructed and opened to traffic in 1935. A 2 682 metre long timber decked viaduct across the outlet to the Pine River, forming part of this highway, was for many years Australia's longest bridge. The Franchise ended when the last toll was paid on 4th October, 1975. A reinforced concrete structure, some 34 metres longer, has recently been built parallel to it. Known as the Houghton Highway, this is now the longest bridge in Australia.

"West Gate"

In 1965 the Victorian Parliament passed a law to set up and establish the "West Gate Bridge Authority" as a non-profit organisation to design, build, and operate a tolled crossing of the Lower Yarra River in Melbourne. The Franchise Period was to be 40 years, commencing from when the bridge was opened in November, 1978. At the end of this period, the bridge would then revert to the State of Victoria. However, in this instance, due to complex financial arrangements, the funding and franchise agreements are being revised, and the State Government has recently moved to reconstitute the company as a State Statutory Authority.

The 2 583 metre long West Gate Bridge (including approaches) is the next longest bridge in Australia and is eight

lanes wide. Tolls range from 60 cents each way for cars to \$2.00 each way for large semi-trailers. Facilities provide for paying the toll by voucher or by cash, and there are both manned and automatic toll barriers in operation. Recently a discount system for regular users has been introduced which reduces the toll fee on cars by about 15 per cent, to 50 cents.

"Gateway Bridge"

By an Act of Parliament, an agreement has been finalised between the Queensland Government and a group of companies forming the Gateway Bridge Co. Ltd., to design, finance, construct, operate and maintain a new 6 lane bridge over the lower reaches of the Brisbane River. This will eventually become part of an arterial road system which will bypass Brisbane on its Eastern side.

The State Government is providing some of the access approaches to the new bridge prior to its opening and a percentage of the income obtained from the toll will be used on construction of approach road extensions when warranted by traffic increases. The Franchise Period will be 30 years.

Left: Entrance to the 2 682 m long viaduct over the Pine River estuary on the "Hornibrook Highway" just north of Brisbane, photographed in 1939. The bridge was opened in 1935 and the last toll paid in October, 1975.

TOLL PLAZAS — FUNCTION AND LAYOUT

Whenever vehicles in a lane of traffic have to stop for any purpose which involves a service operation, and then move on again, fewer vehicles are able to pass the stopping point each hour and a reduction occurs in the capacity of that lane. Typical examples of this are stopping to buy tickets at a drive-in, to purchase parking tickets, or to pay a toll. Thus, to prevent the overall capacity of a road from being reduced, it becomes necessary to increase the number of lanes, both on the approach and through the stop location. For example, the eight traffic lanes on Sydney Harbour Bridge each have a free flowing capacity of about 1700 vehicles per hour. Each toll booth, whether manual or automatic, can pass about 800 vehicles per hour. To maintain the flow rate, each of the approach traffic lanes is served by two or three toll booths (19 booths in all). It is a common misconception that the toll booths on Sydney Harbour Bridge restrict traffic capacity; in fact, the total capacity of all toll booths exceeds both that of the approach needs and of the bridge itself.

Because of this need for traffic to occupy more lanes on approach to toll plazas, and to merge again after leaving them, careful road design is required to ensure that traffic flow remains smooth.

It is obvious from the above that the location and frequency of toll plazas can be a critical factor in the viability of a toll system, particularly in an urban area.

Ideally, the process of paying toll should be achieved with a minimum of confusion and time. In the past, the most common system was to pay a Collector who issued a ticket giving authority to continue. Some of the latest toll plazas are now fully automated, and operate by making payment usually with a coin into a receptacle which electronically records the amount, and if correct, informs the driver to continue by flashing a lighted "Go" signal.

Toll credit account systems have recently been made available for operations of large vehicle fleets and regular commuters on some toll roads and bridges. These arrangements are usually subject to special conditions, and are designed to alleviate the need for operators to provide drivers with cash advances for paying tolls. A further advantage is in minimising delays which sometimes occur at the toll plazas.

Other possibilities, not yet in use in Australia, involve the use of special credit cards, particular identification markings on vehicles, and automatic electronic identification of Public Transport Vehicles. These latter two would avoid stopping the vehicles and consequently assist traffic flows, and in some instances, possibly even lead to a reduction in the number of booths required.

Right: The toll barriers at Berowra on the F3 – Sydney-Newcastle Freeway, just north of Sydney.



Toll gate on Mt Nebo Road, west of Brisbane.

WHAT IS THE POLICY?

Wherever possible, the Australian State Road Authorities try to avoid the introduction or extension of toll systems for roads. Tolls are unpopular with the motoring public and introduce extra costs to the collecting authority.

On the other hand, tolls can provide a most satisfactory means of repaying loans used to finance the construction of a much needed facility. The situation may also occur where a particularly large structure is needed and can be provided at

a much earlier date through financing by tolls. In this instance, where the toll system is not available, many years might elapse before the facility could be provided through normal funding arrangements.

Introduction of these systems is therefore, sometimes desirable to enable the convenient and economical movement of people and goods within our community.

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This is one of a series of brochures being published by THE NATIONAL ASSOCIATION OF AUSTRALIAN STATE ROAD AUTHORITIES to encourage public interest in the work being undertaken by its Member Authorities. These brochures outline some of the social, economic and environmental issues associated with present-day road construction programmes. They emphasise the many benefits which accrue to the community following the provision of better roads and highlight the important role played by roads as one part of an overall transportation system.

The subjects of the thirteen brochures already published are "The History and Challenge of Road Transport", "Roads and National Development", "Roads and Traffic Noise", "Town Bypasses", "Roads and Traffic Safety", "Public Transport on Roads", "Roads and Pollution", "Roads and Public Utilities", "Roads and Pedestrian Safety", "Roads and Neighbourhood Planning", "Road Bridges", "Roads for Recreation and Tourism" and "Roads, Bicycles and Bikeways". Future topics will include "Roads and Energy" and "Road Signs and Markings".

All brochures in the series are designed to be as interesting and informative as possible. Each one gives valuable comments on matters which are of vital importance to all members of the community.

We hope you will read them.

As they are printed, the brochures will become available from any of the State Road Authorities listed here.

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